REMARKS

Claims 48 and 50-53 are pending in the present application. Claims 48, 50, 52, and 53 are rejected under 35 U.S.C. 102(e) as being anticipated by United States Patent 6,074,288 to Nagahara et al. ("the Nagahara reference"). Claim 51 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nagahara in view of United States Patent No. 6,439,967 to Carpenter ("the Carpenter reference").

The disclosed embodiments of the invention will now be discussed in comparison to the cited references. Of course, the discussion of the disclosed embodiments, and the discussion of the differences between the disclosed embodiments and the cited references, do not define the scope or interpretation of any of the claims. Instead, such discussed differences merely help the Examiner appreciate important claim distinctions discussed thereafter.

The present application is directed towards methods and apparatuses for planarizing microelectronic substrates. In an embodiment, as shown in Figure 6 of the present application, a membrane 250 is positioned within a substrate holder 231 that retains a substrate 112 while the substrate is planarized. The membrane 250 includes a peripheral portion 251 that may have a thickness greater than the central portion 252. Alternatively, in other embodiments such as the embodiment disclosed in Figure 5, the peripheral portion 251 may have a thickness that is thinner than the central portion 252. In either case, the membrane 250 may be fabricated from a generally flexible, compressible solid material, as shown in Figure 6, which may be comprised of neoprene or a silicone rubber, although other resilient, flexible and compressible materials may be also used to fabricate the membrane.

When the substrate 112 is undergoing planarization, the substrate holder 231 and the membrane 250 apply downward forces onto the substrate 112 to force the substrate 112 against a planarization pad (not shown in Figure 6). The relatively thicker portions of the membrane 250 correspondingly exert a greater force on portions of the substrate 112 that contact the thicker portions of the membrane 250, while the relatively thinner portions of the membrane 250 exert a lesser force on other portions of the substrate 112. Consequently, the portions of the substrate 112 subjected to the greater normal force are planarized at a greater rate than the portions of the substrate 112 that are in facial contact with the thinner portions of the membrane 250. In particular, when the thicker portions of the membrane 250 are positioned in the peripheral

portion 251 of the membrane 250, substrates 112 having features toward the periphery of the substrate 112 that require higher planarization rates are more effectively planarized since the additional normal force presented by the peripheral portion 251 allows the substrate periphery to be planarized at a greater rate than is achievable by the greater linear velocity at the periphery of the substrate 112 alone. This embodiment is particularly suitable if the peripheral region of the substrate 112 includes features that exhibit a higher hardness than the other regions of the substrate 112.

The Examiner has cited the Nagahara reference as pertinent to the patentability of the claims of the present application. The Nagahara reference is directed toward solving the problem of center slowing that occurs when polishing substrates. Center slowing refers to the condition where the material removal rate at a center region of the substrate during polishing is slower relative to a material removal rate at the periphery of the substrate. In order to reduce the nonuniform material removal rates during polishing, the Nagahara reference employs a carrier film 114 that includes a base layer 110 disposed between a pressure sensitive adhesive layer 108 and a porous layer 112 (See, Figure 2). The porous layer 112 has a protruding dome shape configured to contact a center region of a substrate. As depicted in Figure 3, the pressure sensitive adhesive layer 108 of the carrier film 114 is affixed to a backing plate 104 of a substrate holder assembly 100. A substrate 20, which will ultimately be polished, is positioned to contact the protruding dome shape of the porous layer 112 and is retained on the substrate holder assembly 100 by a circumferential restraint member 106. During chemical mechanical polishing (CMP), a shaft 102 lowers the substrate holder 100 so that the substrate 20 contacts a polishing pad 22. An actuator or motor connected to the shaft 104 rotates the substrate holder assembly 100 including the substrate 20 in order to effect polishing of the substrate 20. The protruding dome of the porous layer 112 applies pressure on a center area of a surface of the substrate 20 to alleviate the problem of center slowing that would ordinarily occur during CMP. Thus, the protruding dome of the porous layer 112 "applies pressure on a center area of a substrate surface, which may be underpolished in a conventional substrate holder assembly if center slow polishing conditions have set in." (Column 7, lines 24-28). While the Nagahara reference provides a solution to the problem of center slowing that results during conventional CMP, it does not

disclose or fairly suggest a carrier film having a configuration for enhancing the material removal rate in a peripheral region of the substrate 20.

The Examiner has also cited the Carpenter reference. In view of the provisions of 35 U.S.C. 103(c), the Carpenter reference may not be used as a reference in a rejection under 35 U.S.C. 103(a). The Carpenter reference may not be properly used in a 35 U.S.C. 103(a) rejection because it is a reference under 35 U.S.C. 102(e)(2) and the Carpenter reference and the present application were commonly owned by Micron Technology Inc. at the time the present invention was made. Accordingly, the Carpenter reference is disqualified as a reference under 35 U.S.C. 103(a) in view 35 U.S.C. 103(c).

Turning now to the claims, the patentably distinct differences between the Nagahara reference and the claim language will be specifically pointed out. Presently amended independent claim 48 recites, in part, "biasing a second annular part of the microelectronic substrate against the planarizing medium with a second force greater than the first force by engaging the second annular part with a second portion of the flexible membrane having a second thickness greater than the first thickness, *the second annular part located in a peripheral region of the microelectronic substrate and the first annular part located in a region of the microelectronic substrate outside the peripheral region.*" (Emphasis Added). The Nagahara reference does not disclose or fairly suggest the above limitations. In fact, as alluded to above, the Nagahara reference teaches away from such a limitation by disclosing applying a greater force to the center region of a substrate to alleviate the problem of center slowing. In contrast, presently amended independent claim 48 requires biasing the second annular part of the microelectronic substrate located in a peripheral region thereof with a force greater than a force that biases a first annular part of the microelectronic substrate located in a region outside the peripheral region. Therefore, presently amended independent claim 48 is allowable over the Nagahara reference. Claims depending from claim 48 are also allowable due to depending from an allowable base claim and further in view of the additional limitations recited in the dependent claims.

All of the claims remaining in the application are now clearly allowable. Favorable consideration and a timely Notice of Allowance are earnestly solicited.

Respectfully submitted,

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